



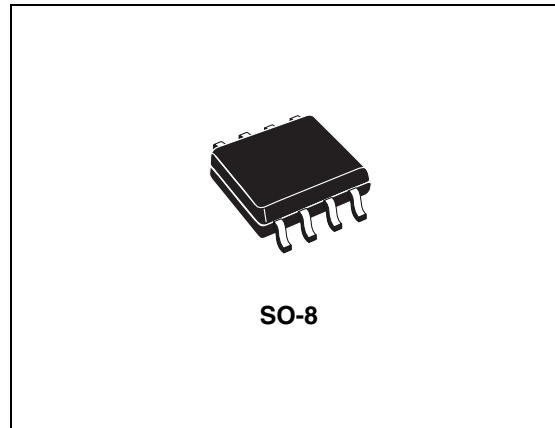
# STS8C5H30L

N-channel 30 V, 0.018  $\Omega$ , 8 A, P-channel 30 V, 0.045  $\Omega$ , 5 A SO-8  
low gate charge STripFET™ III MOSFET

## Features

Type	V <sub>DSS</sub>	R <sub>DS(on) max</sub>	I <sub>D</sub>
STS8C5H30L(N-channel)	30 V	< 0.022 $\Omega$	8 A
STS8C5H30L(P-channel)	30 V	< 0.055 $\Omega$	5 A

- Conduction losses reduced
- Switching losses reduced
- Low threshold drive
- Standard outline for easy automated surface mount assembly



## Application

- Switching applications

## Description

The STS8C5H30L is a Power MOSFET realized with the latest development of STMicroelectronics unique “single feature size” strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing reproducibility.

Figure 1. Internal schematic diagram

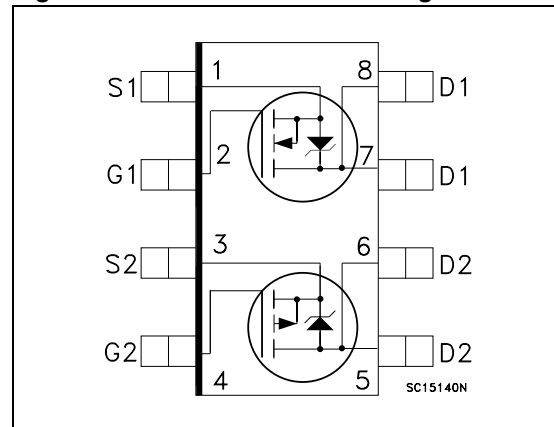


Table 1. Device summary

Part number	Marking	Package	Packaging
STS8C5H30L	S8C5H30L	SO-8	Tape and reel

Note: For the p-channel MOSFET actual polarity of voltages and current has to be reversed

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## Contents

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# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value		Unit
		N-channel	P-channel	
$V_{DS}$	Drain-source voltage ( $v_{gs} = 0$ )	30		V
$V_{GS}$	Gate- source voltage	$\pm 16$	$\pm 16$	V
$I_D$	Drain current (continuous) at $T_C = 25^\circ\text{C}$ single operating	8	5.4	A
$I_D$	Drain current (continuous) at $T_C = 100^\circ\text{C}$ single operating	6.4	4.3	A
$I_{DM}^{(1)}$	Drain current (pulsed)	32	21.6	A
$P_{TOT}$	Total dissipation at $T_C = 25^\circ\text{C}$ dual operating	1.6		W
	Total dissipation at $T_C = 25^\circ\text{C}$ single operating	2		W
$T_{stg}$	Storage temperature	-55 to 150		$^\circ\text{C}$
$T_j$	Operating junction temperature	150		$^\circ\text{C}$

1. Pulse width limited by safe operating area

**Table 3. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-a}^{(1)}$	Thermal resistance junction-ambient single operating	62.5	$^\circ\text{C}/\text{W}$
$R_{thj-a}^{(1)}$	Thermal resistance junction-ambient dual operating	78	$^\circ\text{C}/\text{W}$

1. When mounted on 1 inch<sup>2</sup> FR-4 board, 2 oz. Cu.,  $t \leq 10$  sec

*Note:* For the p-channel MOSFET actual polarity of voltages and current has to be reversed

## 2 Electrical characteristics

( $T_{CASE} = 25\text{ °C}$  unless otherwise specified)

**Table 4. On/off states**

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250\ \mu\text{A}$ , $V_{GS} = 0$	n-ch	30			V
			p-ch	30			V
$I_{DSS}$	Zero gate voltage drain current ( $V_{GS} = 0$ )	$V_{DS} = \text{Max rating}$ $V_{DS} = \text{Max rating}$ , $T_C = 125\text{ °C}$	n-ch			1	$\mu\text{A}$
			p-ch			10	$\mu\text{A}$
$I_{GSS}$	Gate-body leakage current ( $V_{DS} = 0$ )	$V_{GS} = \pm 16\text{ V}$ $V_{GS} = \pm 16\text{ V}$	n-ch			$\pm 100$	nA
			p-ch			$\pm 100$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$ , $I_D = 250\ \mu\text{A}$	n-ch	1	1.6	2.5	V
			p-ch	1	1.6	2.5	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10\text{ V}$ , $I_D = 4\text{ A}$ $V_{GS} = 10\text{ V}$ , $I_D = 2.5\text{ A}$ $V_{GS} = 4.5\text{ V}$ , $I_D = 4\text{ A}$ $V_{GS} = 4.5\text{ V}$ , $I_D = 2.5\text{ A}$	n-ch		0.018	0.022	$\Omega$
			p-ch		0.045	0.055	$\Omega$
			n-ch		0.020	0.025	$\Omega$
			p-ch		0.070	0.075	$\Omega$

**Table 5. Dynamic**

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
$g_{fs}^{(1)}$	Forward transconductance	$V_{DS} = 15\text{ V}$ , $I_D = 4\text{ A}$ $V_{DS} = 15\text{ V}$ , $I_D = 2.5\text{ A}$	n-ch		8.5		S
			p-ch		10		S
$C_{iss}$	Input capacitance		n-ch		857		pF
			p-ch		1350		pF
$C_{oss}$	Output capacitance	$V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$ , $V_{GS} = 0$	n-ch		147		pF
			p-ch		490		pF
$C_{rss}$	Reverse transfer capacitance		n-ch		20		pF
			p-ch		130		pF
$Q_g$	Total gate charge	<b>N-channel</b> $V_{DD} = 24\text{ V}$ , $I_D = 8\text{ A}$ $V_{GS} = 5\text{ V}$	n-ch		7	10	nC
			p-ch		12.5	16	nC
$Q_{gs}$	Gate-source charge	<b>P-channel</b> $V_{DD} = 24\text{ V}$ , $I_D = 4\text{ A}$ $V_{GS} = 5\text{ V}$	n-ch		2.5		nC
			p-ch		5		nC
$Q_{gd}$	Gate-drain charge	$V_{GS} = 5\text{ V}$ <i>(see Figure 27)</i>	n-ch		2.3		nC
			p-ch		3		nC

1. Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5.

*For the p-channel MOSFET actual polarity of voltages and current has to be reversed*

Table 6. Switching times

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	<b>N-channel</b>	n-ch		12		ns
			p-ch		25		ns
$t_r$	Rise time	$V_{DD} = 15\text{ V}$ , $I_D = 4\text{ A}$ $R_G = 4.7\ \Omega$ , $V_{GS} = 4.5\text{ V}$	n-ch		14.5		ns
			p-ch		35		ns
$t_{d(off)}$	Turn-off delay time	<b>P-channel</b> $V_{DD} = 15\text{ V}$ , $I_D = 2\text{ A}$ $R_G = 4.7\ \Omega$ , $V_{GS} = 4.5\text{ V}$	n-ch		23		ns
			p-ch		125		ns
$t_f$	Fall time	<i>Figure 26</i>	n-ch		8		ns
			p-ch		35		ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain current		n-ch			8	A
			p-ch			5	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		n-ch			32	A
			p-ch			20	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 8\text{ A}$ , $V_{GS} = 0$ $I_{SD} = 5\text{ A}$ , $V_{GS} = 0$	n-ch			1.5	V
			p-ch			1.2	V
$t_{rr}$	Reverse recovery time	<b>N-channel</b> $I_{SD} = 8\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$	n-ch		15		ns
			p-ch		45		ns
$Q_{rr}$	Reverse recovery charge	$V_{DD} = 15\text{ V}$ , $T_j = 150\text{ }^\circ\text{C}$ <b>P-channel</b> $I_{SD} = 5\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$	n-ch		5.7		nC
			p-ch		36		nC
$I_{RRM}$	Reverse recovery current	$V_{DD} = 15\text{ V}$ , $T_j = 150\text{ }^\circ\text{C}$ <i>Figure 28</i>	n-ch		0.76		A
			p-ch		1.6		A

1. Pulse width limited by safe operating area.

2. Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5%

*Note:* For the p-channel MOSFET actual polarity of voltages and current has to be reversed

## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area n-ch

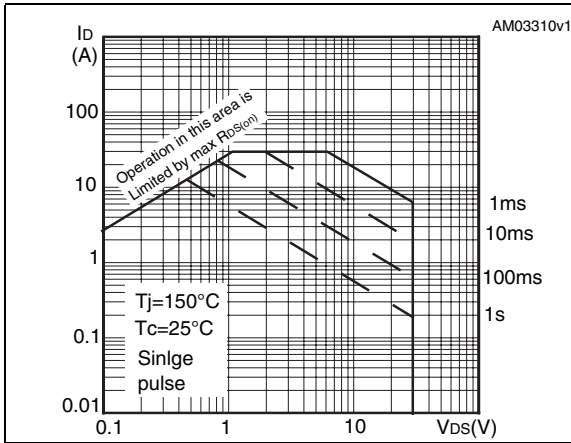


Figure 3. Thermal impedance n-ch

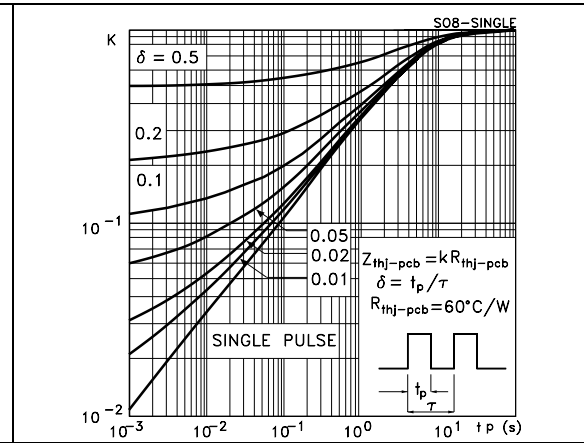


Figure 4. Output characteristics n-ch

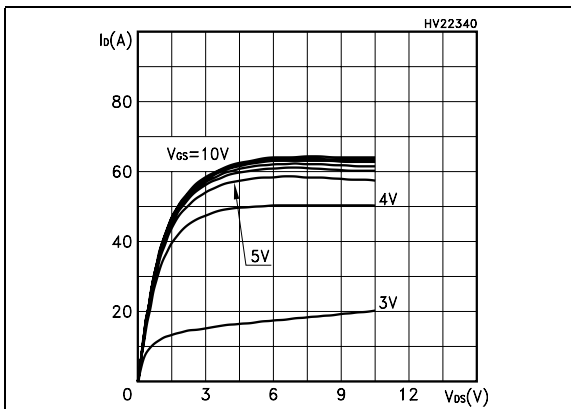


Figure 5. Transfer characteristics n-ch

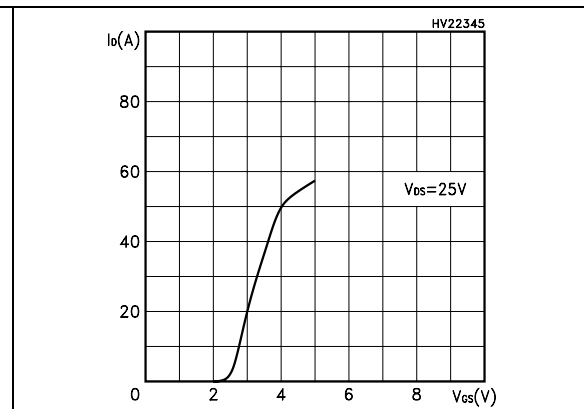


Figure 6. Transconductance n-ch

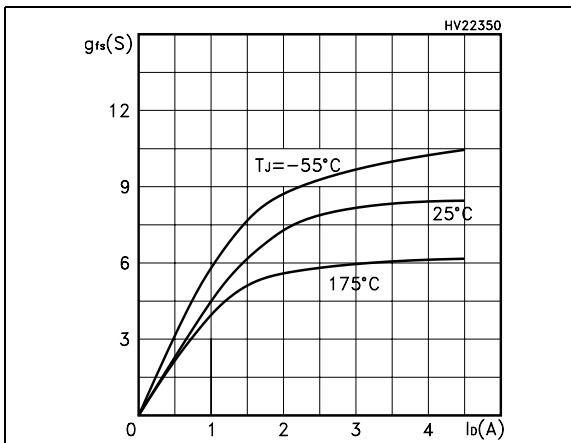
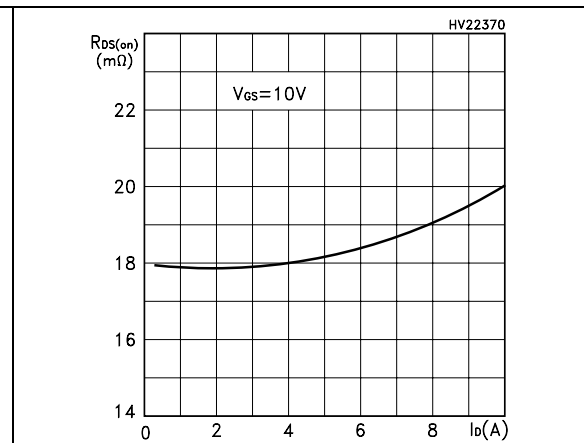
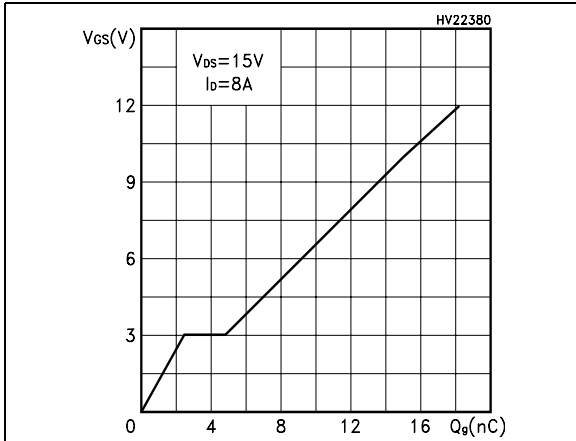


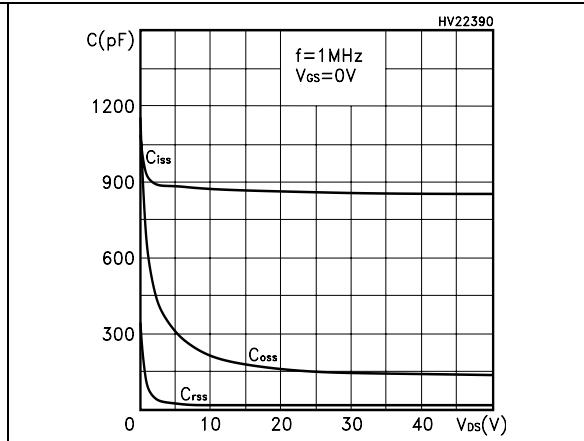
Figure 7. Static drain-source on resistance n-ch



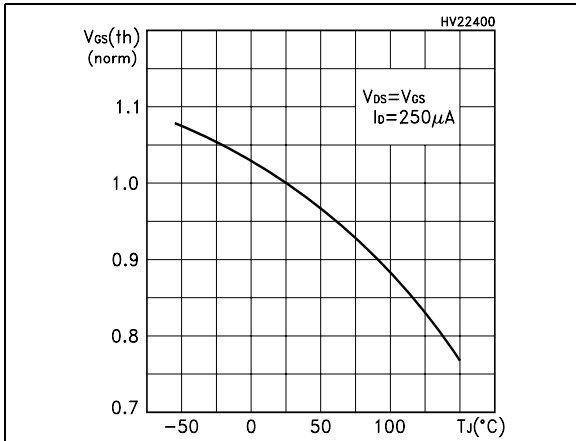
**Figure 8. Gate charge vs. gate-source voltage n-ch**



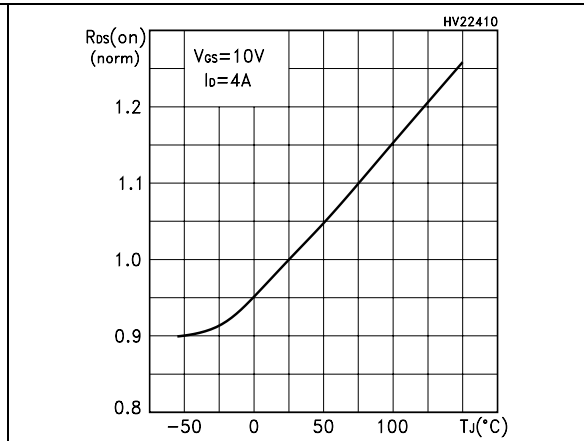
**Figure 9. Capacitance variations n-ch**



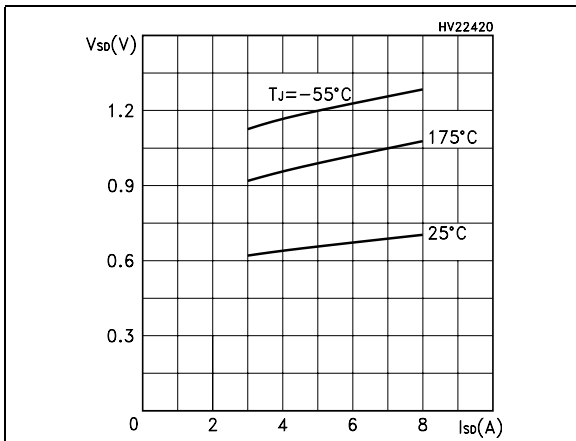
**Figure 10. Normalized gate threshold voltage vs. temperature n-ch**



**Figure 11. Normalized on resistance vs. temperature n-ch**



**Figure 12. Source-drain diode forward characteristics n-ch**



**Figure 13. Normalized breakdown voltage vs. temperature n-ch**

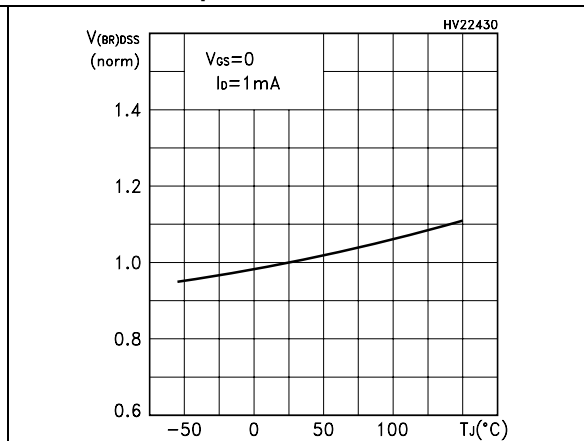


Figure 14. Safe operating area p-ch

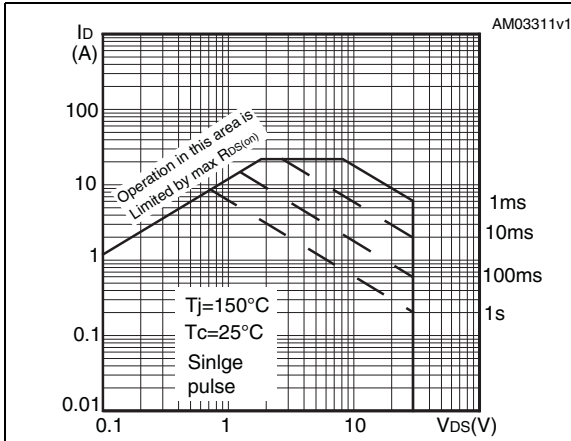


Figure 15. Thermal impedance p-ch

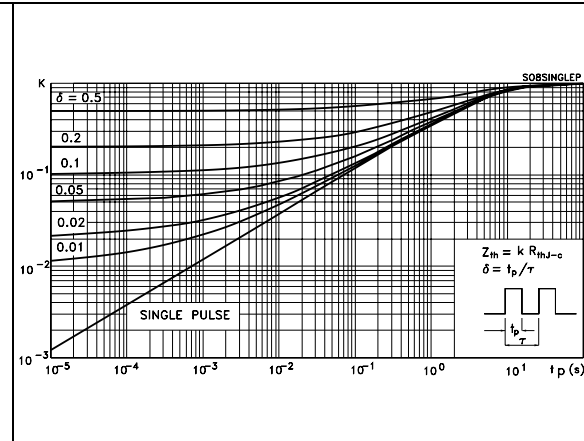


Figure 16. Output characteristics p-ch

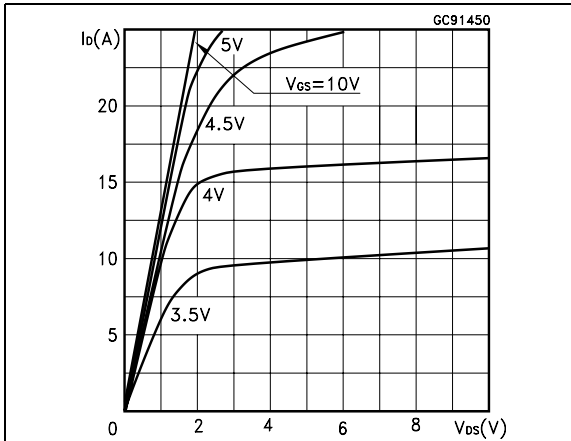


Figure 17. Transfer characteristics p-ch

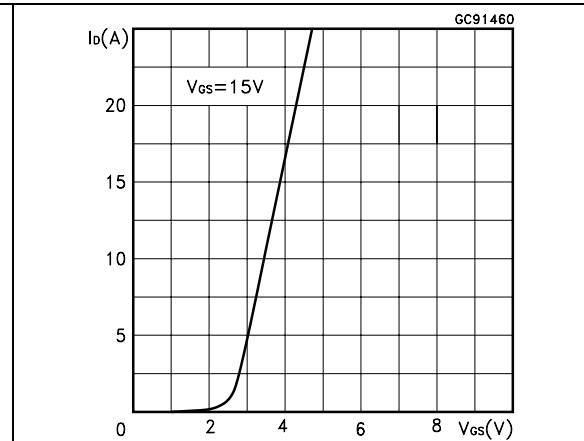


Figure 18. Transconductance p-ch

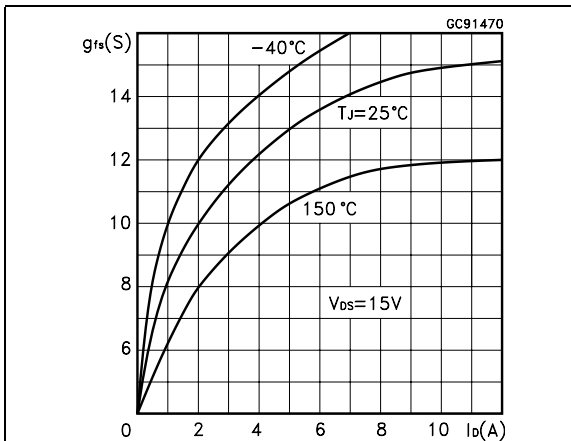


Figure 19. Static drain-source on resistance p-ch

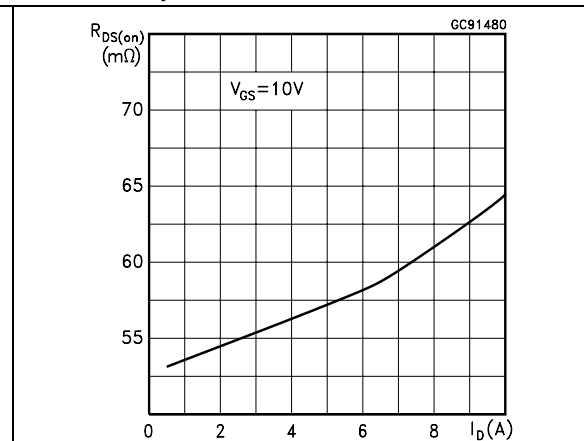




Figure 20. Gate charge vs. gate-source voltage p-ch

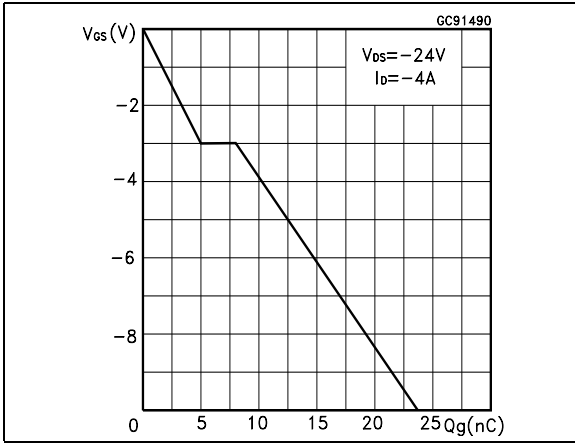


Figure 21. Capacitance variations p-ch

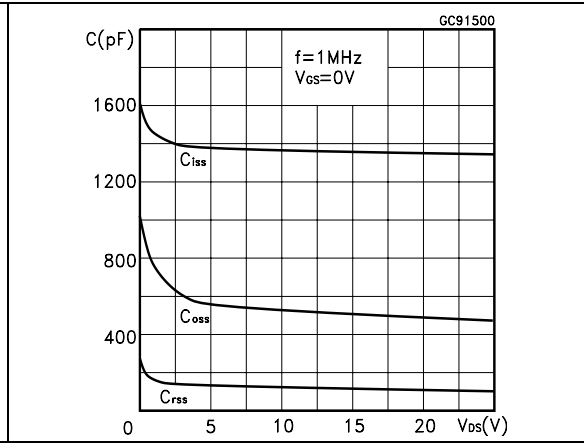


Figure 22. Normalized gate threshold voltage vs. temperature p-ch

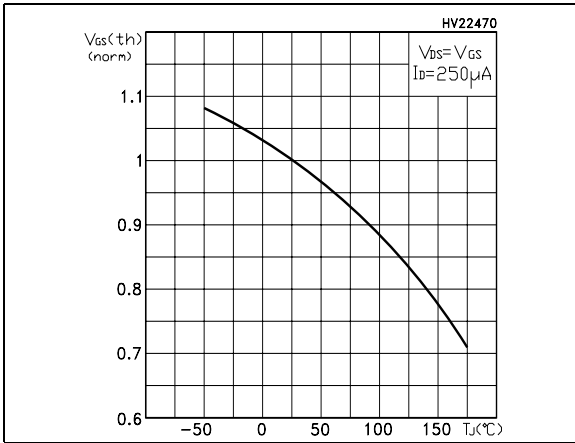


Figure 23. Normalized on resistance vs. temperature p-ch

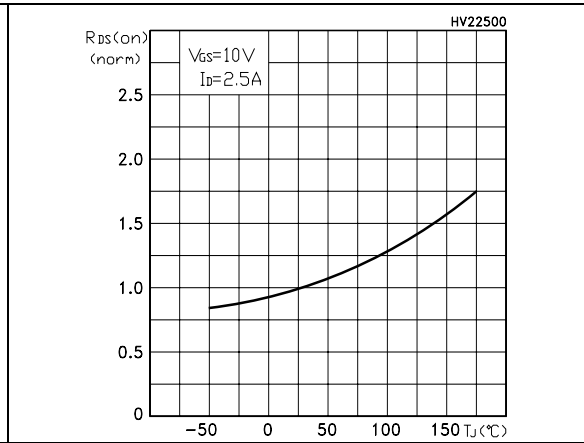


Figure 24. Source-drain diode forward characteristics p-ch

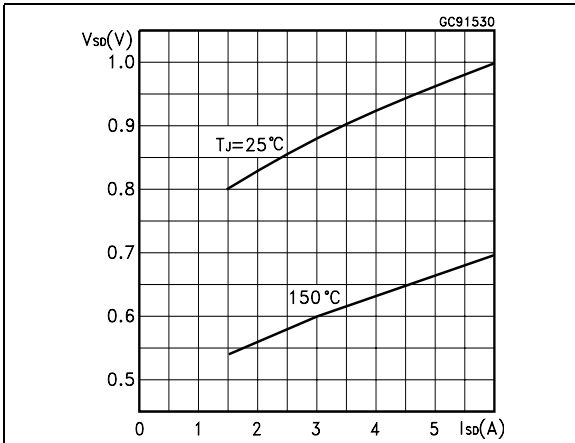
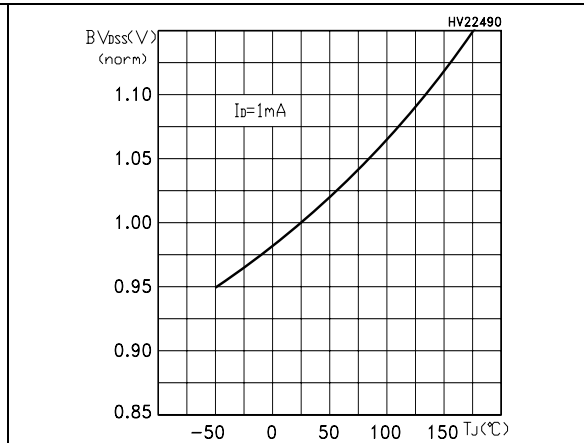


Figure 25. Normalized breakdown voltage vs. temperature p-ch



### 3 Test circuits

Figure 26. Switching times test circuit for resistive load

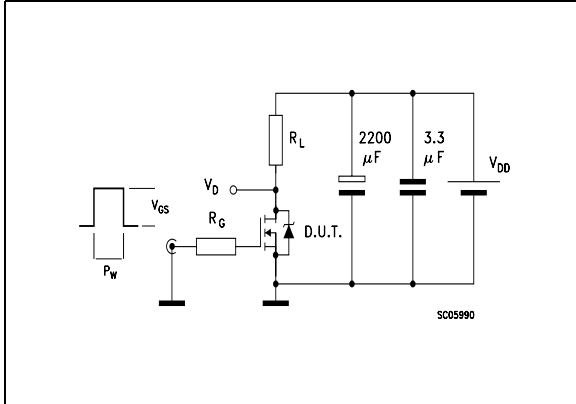


Figure 27. Gate charge test circuit

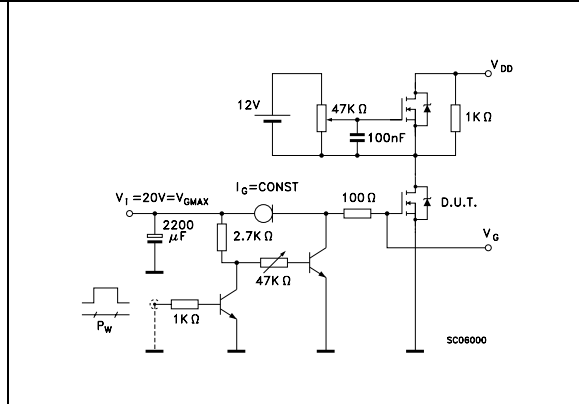


Figure 28. Test circuit for inductive load switching and diode recovery times

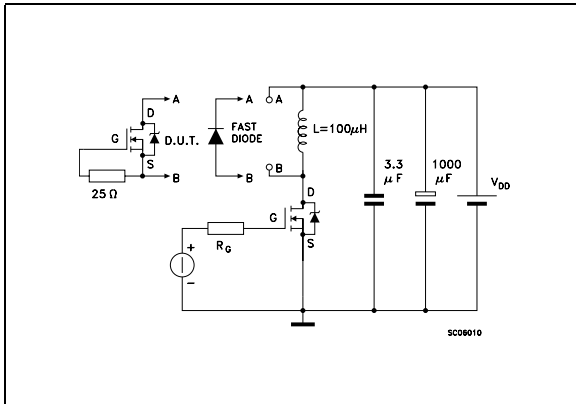


Figure 29. Unclamped inductive load test circuit

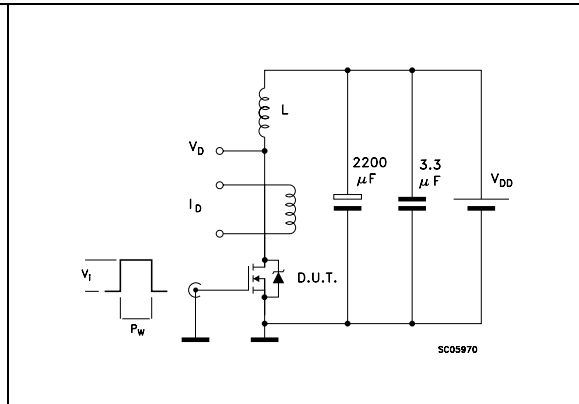


Figure 30. Unclamped inductive waveform

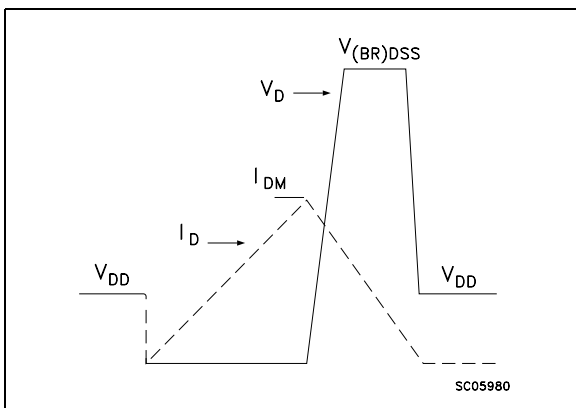
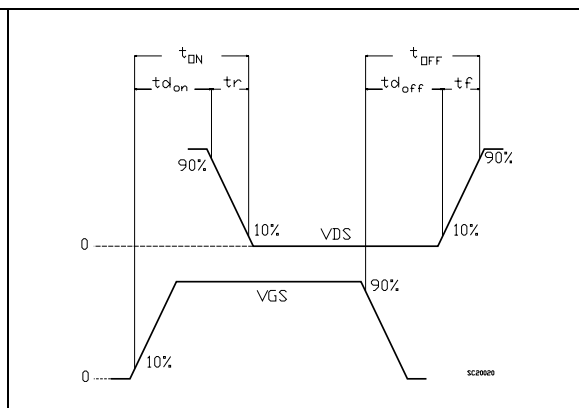


Figure 31. Switching time waveform

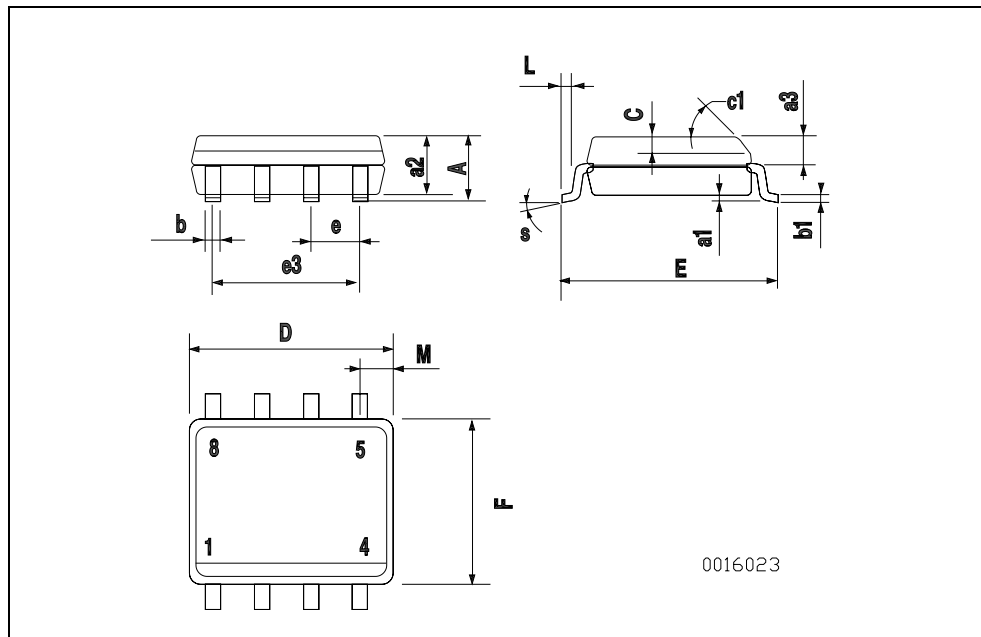


## 4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK<sup>®</sup> is an ST trademark.

**SO-8 MECHANICAL DATA**

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.25	0.003		0.009
a2			1.65			0.064
a3	0.65		0.85	0.025		0.033
b	0.35		0.48	0.013		0.018
b1	0.19		0.25	0.007		0.010
C	0.25		0.5	0.010		0.019
c1	45 (typ.)					
D	4.8		5.0	0.188		0.196
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		3.81			0.150	
F	3.8		4.0	0.14		0.157
L	0.4		1.27	0.015		0.050
M			0.6			0.023
S	8 (max.)					



0016023

## 5 Revision history

Table 8. Revision history

Date	Revision	Changes
17-Sep-2004	1	First revision.
31-Oct-2006	2	The document has been reformatted.
30-Jan-2007	3	typo mistake on <a href="#">Table 2</a> .
23-Jul-2007	4	<a href="#">Figure 14</a> has been updated.
23-Feb-2009	5	<a href="#">Figure 2</a> , <a href="#">Figure 3</a> , <a href="#">Figure 14</a> and <a href="#">Figure 15</a> have been changed.
10-Jun-2010	6	Updated $V_{GS(th)}$ in <a href="#">Table 4: On/off states</a> .

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